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ABSTRACT

This paper addresses itself to the question of whether the high degree of abstractness in Chomsky's and Halle's analysis of English vowels is justified. Secondarily, two related topics are discussed: (1) limitations on the tongue-height features [+low] and [+high] and (2) the role of rule features in phonological rules. Numerous examples of a more simplified representational system are provided, as well as a brief bibliography. (DD)

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How Abstract is English Vowel Phonology?

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The primary question this paper addresses itself to is whether the high degree of abstractness in Chomsky and Halle's analysis of English vowels is justified. Two related topics to be discussed are (1) some widely-accepted limitations on the tongue-height features [+low] and [+high] and (2) the role of rule features in phonological rules.

An important question for phonology is whether the distinctive features [+low] and [+high] can be tautosegmental on the phonological level, that is, whether both features can be assigned to the same abstract underlying segment. In general, scholars have refrained from postulating underlying segments containing both [+low] and [+high]. Chomsky and Halle (1968:305), for example, argue that 'the phonetic characterization of "low" and "high" rules cut sounds that are [+low, +high] for it is impossible to raise the body of the tongue above the neutral position and simultaneously lower it below that level.'

Having correctly noted some limitations on the behavior of the tongue, Chomsky and Halle (1968:404-5) convert the restriction on tautosegmental [+low, +high] into marking conventions. Their proposed conventions (VII & IX) reflect a claim that the [+low, +high] combination is impossible in abstract lexical representations. Since lexical representations and marking conventions embody hypotheses about representations internalized by a speaker, Chomsky and Halle's restriction is thus a claim about constraints on the mind. Note that there is an implicit assumption here that limitations on the behavior of certain vocal organs are paralleled by corresponding restrictions on mental representations. For this assumption no support has been offered. Moreover there is no a priori reason to expect that observations of tongue movements will provide a basis for postulating constraints on the abstract mental organization of language.

Rather than summarily excluding tautosegmental [+low, +high] without due consideration, a nondogmatic approach to this question might begin by inquiring whether there are any phonological units whose corresponding phonetic realizations include a movement of the tongue from a lower to a higher position. As a matter of fact, English has three, namely

the true diphthongs /$_{a}$I $_{ɔ}$I $_{a}$U/ as *high*, *boy*, and *how*. A complete specification of the distinctive features of these true diphthongs is shown at the top of Table 1.

	[+front, -round]	[+front, +round]	[-front, -round]	[-front, +round]
[+low, +high]	/aI/ *high*	/ɔI/ *boy*		/aU/ *how*
[-low, +high]	/i/ *feat* /I/ *fit*	/ʏu/ *beauty*		/u/ *booty* /U/ *look*
[-low, -high]	/e/ *bait* /ɛ/ *bet*		/ʌ/ *luck*	/o/ *loan*
[+low, -high]	/æ/ *bat*		/a/ *father*	/ɔ/ *lawn* /ɔ̌/ *hot* (RP)

Table 1. Underlying Vowels in Modern English

Because they exclude the [+low, +high] combination, Chomsky and Halle have no adequate means for characterizing the true diphthongs on the phonological level. Thus instead of positing underlying /$_{a}$I $_{ɔ}$I $_{a}$U/ in *high*, *boy*, and *how*, Chomsky and Halle propose /i $_{æ}$ u/, respectively. Moreover, other tense vowels have equally abstract underlying representations. Instead of /i/ and /e/ as the stressed vowels of *extreme* and *sane*, Chomsky and Halle propose /e/ and /æ/. They attempt to justify their particular choice of underlying representations by claiming that the abstractness of the representations is necessary in order to account for the alternations of vowels in related words, e.g. *divine-divinity*, *extreme-extremity*, and *sane-sanity*. However, it is easy to show that when the restriction against tautosegmental [+low, +high] is removed, the vowel alternations can, in general, be accounted for with a less abstract set of underlying representations. We can posit, for example, that /aI i e/ (instead of Chomsky and Halle's /i e æ/) underlie phonetic

[a^I i e] in *divine*, *extreme*, and *sane*. The corresponding [I ɛ æ] of *divinity*, *extremity*, and *sanity* are derived from /a^I i e/ via two rules: Laxing Rule (1) and Vowel Alternation Rule (3). The latter applies to the laxed vowels. The derivations are as follows:

	divinity	*extremity*	*sanity*
Underlying vowel	a^I	i	e
(1) Laxing	$\breve{a}^I$	I	ɛ
(3) Vowel alternation	I	ɛ	æ

A partial list of rules needed to account for vowel alternations in English is given below. Rules 1, 2, and 5 are informal versions of rules proposed by Chomsky and Halle.

(1) Laxing

$$V \rightarrow [-\text{tense}] / __ C \begin{Bmatrix} C \\ (C)\ ic \\ (C)\ ish \\ (C)\ V\ (C)\ V \end{Bmatrix}$$

(2) Tensing

$$\begin{bmatrix} V \\ -\text{high} \end{bmatrix} \rightarrow [+\text{tense}] \ / \ __ C \begin{Bmatrix} i \\ I \\ e \\ ɛ \end{Bmatrix} \ V$$

(3) Vowel alternation

$$\begin{bmatrix} V \\ \alpha\text{low} \\ \beta\text{high} \\ -\text{tense} \\ +\text{Rule VA} \end{bmatrix} \rightarrow \begin{bmatrix} -\beta\text{low} \\ \alpha\text{high} \end{bmatrix}$$

(4) Lax nonhigh vowels are not rounded (Add [-low] on the left of the arrow for British Received Pronunciation.)

$$\begin{bmatrix} V \\ -\text{high} \\ -\text{tense} \end{bmatrix} \rightarrow [-\text{round}]$$

(5) Vowel reduction: Unstressed lax vowels are reduced to schwa

$$\begin{bmatrix} V \\ -\text{tense} \\ -\text{stress} \end{bmatrix} \rightarrow ə$$

Four of the above rules are utilized in the derivation of *harmony*-*harmonious*-*harmonic*:

	harmony	*harmonious*	*harmonic*
Underlying vowel	ŏ	ŏ	ŏ
Stress assignment		ŏ́	ŏ́
(2) Tensing		o	
(3) Vowel alternation	ɔ́		ɔ́
(4) Lax nonhigh vowels are not rounded	a		á
(5) Vowel reduction	ə		

The other alternations discussed by Chomsky and Halle (1968) can be accounted for in a similar manner (for details, see Krohn 1972c).

In addition to examining alternations, it is also important to ascertain how items without alternate forms are to be accounted for. It is when we examine nonalternating items in English that the overly abstract nature of Chomsky and Halle's analysis becomes particularly evident. For example, instead of positing /ɔ/ as the underlying representation of the vowels in *moss*, *lawn*, and *maudlin*, Chomsky and Halle (1968: 211, 206, 208) propose /ŏ a u/, respectively. It appears that to account for phonetic [ɔ] in words spelled with o, Chomsky and Halle posit underlying /ŏ/; in monosyllables with aw or au, they posit /a/; and in polysyllables with aw or au, they posit /u/. The derivations are as follows:

	moss	*lawn*	*maudlin*
underlying representation	ŏ	a	u
Tensing and unrounding	ʌ		
Lowering	a		
Diphthongization	aw	aw	uw
Glide vocalization	aU	aU	uU
Vowel shift	aŏ	aŏ	ɔŏ
Rounding adjustment	ɔʌ	ɔʌ	ɔʌ

In place of the high degree of abstractness entailed in the above derivations, I would like to suggest that in each case the underlying representation of the vowel is /ɔ/. No overly abstract underlying representation is necessary. Consequently, no phonological rules are needed to provide the link between the underlying /ɔ/ and corresponding phonetic [ɔ].

The reason that Chomsky and Halle cannot posit an underlying /ɔ/ in *moss*, *lawn*, and *maudlin* is that in their analysis all instances of /ɔ/ shift to /o/ via the Vowel Shift Rule (which applies indiscriminately to vowels whether a genuine alternation is involved or not). In contrast, the Vowel Alternation Rule (3) proposed here applies solely to lexical formatives with alternate forms. This is because the feature [+Rule VA], where VA is the number of the rule, restricts the application of the rule to those items which are marked for it. Unless the rule is restricted in such a way, it will give an unwarranted 'free-ride' to vowels in a host of nonalternating formatives.

The inclusion of a rule feature, such as [+Rule VA], should be considered as a hypothesis concerning the relative productivity of a rule (Krohn 1972a). While rules without such features capture the highly productive processes of a language, rules with rule features characterize some of the less productive or nonproductive processes. Since experimental evidence shows the relative nonproductivity of the Vowel Alternation Rule, the assignment of a rule feature to the rule thus has independent empirical support (Krohn, Steinberg, & Kobayashi 1972).

For another example of a nonalternating item with a highly abstract underlying vowel, let us examine *cow*. Here Chomsky and Halle posit an underlying /u/, which surfaces as phonetic [aU] after a rather torturous path involving diphthongization (u→uw), vowel shift (uw→ow→ɔw), and rounding adjustment (ɔw→aw). In the alternative analysis proposed here, *cow* has an underlying /a^U/ thereby remaining nondistinct from the corresponding phonetic representation. Only one phonological rule is involved in the derivation, a diphthongization rule that rewrites single-segment /a^U/ as a diphthong with [+long] preceding [+high] (Krohn 1972c).

We could continue our investigation of nonalternating forms in English by examing such common items as *high*, *tree*, *play*, *too*, *low*, and *law*, where Chomsky and Halle posit underlying /hi/, /tre/, /plǣ/, /to/, /lɔ/, and /la/, respectively. In each case, Chomsky and Halle require a rather complex derivation for a simple, ordinary word.

In conclusion, a certain amount of the abstractness of representations and complexity of derivations that we see in Chomsky and Halle's treatment of nonalternating forms is a direct result of not restricting the application of the Vowel Shift Rule to alternating forms. As was suggested above, the addition of a rule feature to the Vowel Alternation Rule provides a straightforward solution to this problem.

Another crucial factor contributing to the complexity of Chomsky and Halle's analysis seems to be their rather arbitrary limitation on the features [+low] and [+high], which rules out a natural way of characterizing the true diphthongs. Given the mentalist orientation of linguistics, it is extremely difficult to take the restriction seriously. Instead one might argue that in a theory of linguistic competence, tongue-performance limitations are somewhat irrelevant. Although a mentalist theory minus a restriction based on tongue-performance limitations is more abstract that one containing such restriction, it appears that with this added amount of abstractness, English vowel phonology is revealed as being much less abstract than Chomsky and Halle's analysis would suggest.[1]

Note

[1]This is a slightly revised version of a paper presented on October 27, 1972 in Washington, D.C. at the eighth meeting of the Southeastern Conference on Linguistics (S.E.C.O.L.). I would like to thank Charles-James Bailey, James Hoard, and Danny Steinberg for their questions and comments. I am especially indebted to Danny Steinberg for many hours of stimulating discussion and for his many helpful suggestions.

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